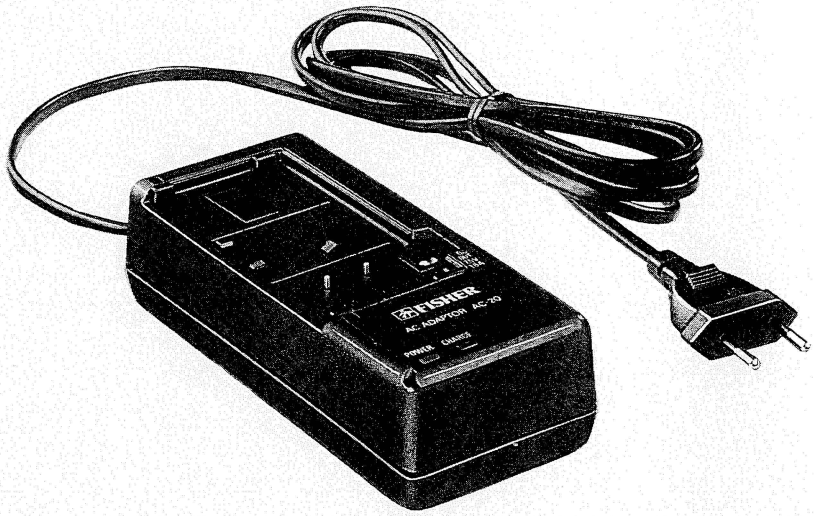
# SERVICE MANUAL

FISHER

# AC-20

## AC Adaptor

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AC-20/GF

REFERNCE No. WM-550140

## PRODUCT SAFETY NOTICE

Product safety should be considerd when a component replacement is made in any area of a AC Adaptor. Components indicated by the symbol ⚠ in the parts list and the schematic diagram designate components in which safety can be of special significance. It is particularly recommended that only parts designated on the parts list in this manual be used for component replacement designated by the symbol. No deviations from resistance, wattage or voltage ratings may be made for replacement items designated by the symbol.

## Specifications

| | |
|---|---|
| **Power requirements** | 100−240V AC,50/60Hz |
| **Power consumption** | 24W |
| **Output voltage** | DC OUT:7.5V, 1.6A in operating mode<br>Battery charge terminal : 10V, 1.4A in charge mode |
| **Applicable batteries** | Ni−Cad battery pack NP−55 or NP−77 |
| **Operating temperature** | 0°C to 40°C (32°F to 104°F) |
| **Storage temperature** | −20°C to 60°C (−4°F to 140°F) |
| **Dimensions (approx.)** | 64×41×145mm (w/h/d)<br>2.5×1.6×5.8 (inches)<br>including projecting parts and controls |
| **Weight (approx.)** | 350g (12.3 oz) |

● Specifications and design are subject to change without notice.

# 1. Explanation on Operation of Power Source Circuit

### 1-1 Summary

This power source is a switching regulator of flyback system. AC input is once rectified to DC voltage at D101, and is transmitted as power through T101 to secondary circuit with repetition of ON / OFF at Q101 at approx. 120 KHz. Then, AC input is rectified at D201 to provide a stabilized DC output voltage. An AC input voltage and load fluctuation is stabilized by changing of the on-duty of Q101.

# 2. Operation of Each Circuit

### 2-1 Rectifying Circuit

AC input from power source line is once rectified to DC voltage at D101 and C114. R102 is a resistance for limiting rush current. L101, L102, and C101 through C106 are for preventing noise. R101 and R120 is a resistance for discharging the charge of C101.

### 2-2 Primary Circuit

Pulse voltage of approx. 120 KHz is generated at primary winding of T101, by switching operation at Q101, from DC voltage produced at rectifying circuit of the section 2-1. Further, pulse is induced at secondary winding and primary feedback winding of T101. With respect to AC input voltage and load fluctuation, the output is stabilized in such a manner that the pulse signal with the on-duty corresponding to the dimension of detecting signal, which has been transmitted from secondary winding through IC102 to pin ② of IC101, is outputted from pin ⑤ of IC101 to change the on-duty of Q101. R103, R104, R105 and C115 are for supplying starting voltage at the time of AC input, and the pulse which has been generated at feedback winding of T101 is rectified by D104 and C115 and serves as the operation power source of IC101 at the time of stationary operation. C112 is an oscillation circuit; C113 is a soft start circuit for preventing over-shoot at the time of rising; D106 is an OVP circuit for suspending output if over-voltage is applied to Vcc of IC101, R116, R110, R111 and C111 are current limiting circuits, and R106 and C108 are circuit for matching the timing of a signal of pin ② of IC101 with a feedback signal. D107, R109 and R118 transmit the pulse, which is outputted from pin ⑤ of IC101, to Q101. F102 is a thermal fuse, and R115, C109 and D102 are snubber circuits for preventing abrupt voltage rise which is generated at primary winding of T101 when Q101 is OFF.

### 2-3 Secondary Circuit

The pulse voltage generated at secondary winding of T101 is rectified by D201, C201, L201 and C202 to become a DC stabilized output voltage. C209, R223, C211 and C206 are for preventing spike. IC201 is a detector for detecting constant voltage and constant current, and constant voltage control is performed by comparing the voltage split at R202, VR201 and R203 with the voltage of D204. Constant current control is performed by comparing the voltage, which is obtained by splitting the voltage of D204 and the voltage drop at R201 by R209, R210, VR202, R211 and R218, with GND. The operation mode is switched by H (HIGH) / L (LOW) of pin ③ of CN201: when the pin is H, the mode becomes VTR, and when it is L, the mode becomes charge.

### 2-4 Signal Transfer from Secondary Circuit to Primary Circuit

When the output voltage rises, voltage is applied to light emitting diode of IC102, and when pin ① or pin ⑦ of IC201 becomes L, current flows through light emitting diode of IC102, thereby turning ON photoreceptor transistor. Then, the current is transmitted to pin ② of IC101 to control the on-duty of Q101, thereby stabilizing the output.

# 3. Explanation on Operation of Charge Circuit

### 3-1 Initialization at the Time of Input of Power Source and Operation Modes

When the adapter is plugged in the AC outlet, + B voltage is applied through + 5 V constant voltage circuit, which is configured by IC202 and C210, from pin ④ of CN201 to pins ⑳ and ④ of microcomputer IC401 and to reset terminal pin ⑲ at the timing determind by R406, D404 and C401, so that the microcomputer is rest and initialized. Operation modes are shwon in Fig. 1.
At the time of initialization, pin ⑬ of IC401 goes to H, so that D401 of LED goes off.

| I / O port | Mode | Initial | Normal charge | Rapid charge | Discharge | Full charge | Abnormal BATT | V.T.R. |
|---|---|---|---|---|---|---|---|---|
| $R_0$ | Normal charge | H | H | H | L | H | L | H |
| $R_1$ | Rapid charge | L | L | H | L | L | L | L |
| $R_2$ | Charge indication | H | L | L | H | H | H ⇄ L | H |
| $R_3$ | Discharge indication | H | H | H | L | H | H | H |
| $R_4$ | Charge mode (VTR CHG) | H | L | L | L | L | L | H |
| $R_5$ | CHG / VTR | L | H | H | H | H | H | L |
| $R_6$ | Discharge mode | L | L | L | H | L | L | L |
| $R_7$ | Discharge switch | H | H | H | L | H | H | H |
| $R_8$ | Battery detecting switch | L | H | H | H | H | H | L |
| $R_9$ | VTR / CHG | H | L | L | L | L | L | H |

Fig. 1

### 3-2 Start of Charging

When a battery is mounted and SW402 is conducted, the voltage is applied from pin ⑤ of CN401 through R411 and R412 to pin ② of IC401, so that the pin goes from L to H. At this point, pin ③ of IC401 goes through CN201 ③ from H to L, and the mode becomes CHG. At this point, pin ⑬ of IC401 goes from H to L to cause the red LED D401 for charge indication to go on. In this condition, when AN terminal voltage is a specified value A (approx. 4.7 V at battery terminal) or more, pin ⑫ goes to H, and Q301 and Q302 are turned ON, thereby causing the rapid charge current to be outputted through D301 and CN401 pin ⑥ (rapid charge mode). When the AN terminal voltage does not reach the specified value A, the charge current is outputted through R305 and D301 (normal charge mode).

### 3-3 Suspension of Charging

When any one among ⓐ ⊿V full charge detecting circuit, ⓑ timer circuit, ⓒ battery open detecting circuit, and ⓓ battery low voltage detecting circuit, which are provided in the microcomputer, operates during the rapid charge mode, and when battery-mounted SW (SW402) is turned OFF, the charging is suspended. When the circuits ⓐ and ⓑ operate, or when the circuit ⓒ operates a certain time after the charging is started, D401 goes from red-light ON to OFF, which is an indication of completion of charging. If the circuit ⓒ operates immediately after the charging is started, D401 goes from red-light ON to red-light flickering, which is an indication of some trouble in the charged batteries. If normal charging continues for more than a certain time, D401 also goes from red-light ON to red-light flickering, which is an indication of trouble with batteries. When the battery-mounted SW is turned OFF, the red light goes off and the mode becomes VTR.

### 3-4 ⊿V Full Charge Detecting Circuit

When the batteries approach full charge, the voltage of charging draws a curve shown in Fig. 2. That is, the charging voltage reaches peak Vp and then drops, and when the voltage drops by approx. 100 mV from Vp, the charging is finished. This voltage change is monitored by IC401 pin ⑥, and detected within IC401. The voltage change is inhibited for a certain time (time for charging over-charged battery is prolonged) according to the initial condition of batteries, so that the ⊿V full charge detecting circuit cannot operate immediately after charging is started.

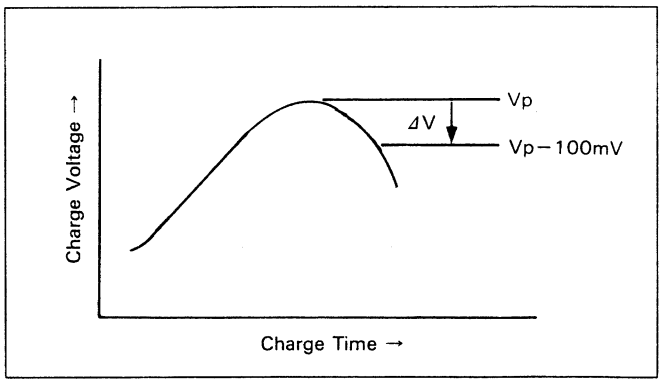



Fig. 2

### 3-5 Timer Circuit

Timer circuit is also built in the microcomputer (IC401). The charging is finished in approx. 180 minutes from the start of rapid charging.

### 3-6 Battery Open Detecting Circuit

If the battery voltage monitored by IC401 pin ⑥ is over a specified voltage D (approx. 9.7 V at battery terminal) immediately after charging is started, it is judged that the battery has some trouble (open), and charging is suspended and red LED is flickered. When the battery

voltage exceeds the specified voltage D after a certain time has elapsed following the start of charging, it is judged that the battery is fully charged, and charging is suspended and red LED goes off.

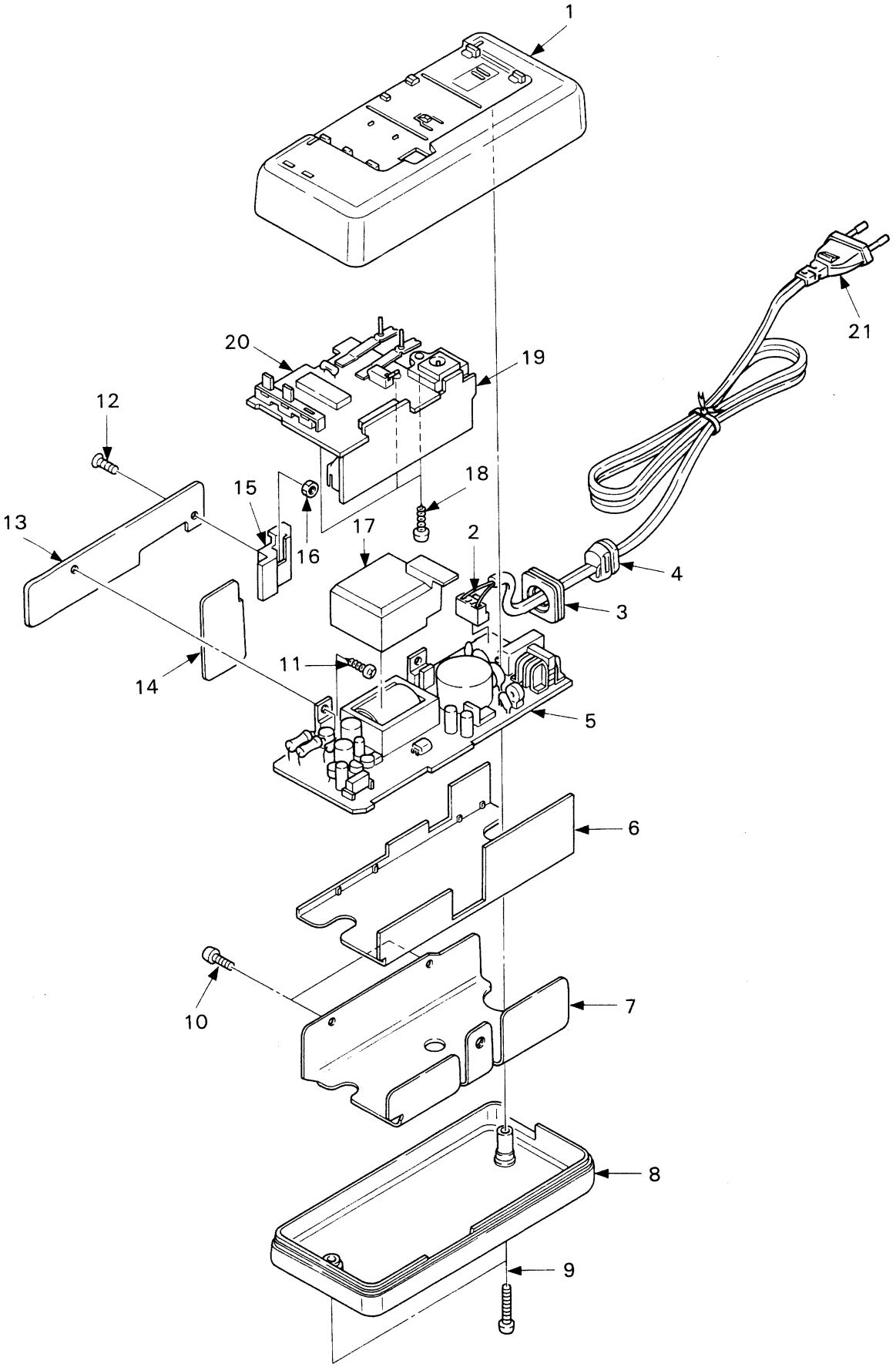
### 3-7 Battery Low Voltage Detecting Circuit

If the condition below a specified voltage A (normal charging mode) continues for a certain time after charging is started, it is judged that the battery has some trouble (internal short), and charging is suspended and red LED is flickered. If the battery voltage does not reach a specified voltage B even after a certain time has elapsed following the start of rapid charging, it is also judged that the battery has some trouble (internal short). If the battery voltage is below a specified voltage C when the $\Delta V$ full charge detecting circuit operates, it is also judged that the battery has some trouble (deteriorated internal unit).

### 3-8 Release of Full Charge Indication and Battery Abnormal Indication

Full charge indication (red LED lighting) and battery abnormal indication (red LED flickering) are released and the LEDs are turned off, by removing the batteries to turn off the battery-mounted SW (SW402).

## 4. Parts List



## 4-1. Cabinet Parts

| Location No. | Parts No. | Description |
|---|---|---|
| 1 | 636 038 0998 | ASSY CABINET TOP |
| 2 | 636 026 4090 | PLG 4P |
| 3 | 636 024 5969 | HOLDER |
| 4 | 636 014 2145 | FIXER |
| 5 | 636 037 1323 | COMPL MA-1 |
| 6 | 636 035 6634 | INSULATOR |
| 7 | 636 035 6627 | SHIELD |
| 8 | 636 026 4809 | CABINET, BOTTOM |
| 9 | 411 109 9502 | SCR S-TPG PAN 2.6 × 25 |
| 10 | 411 031 0103 | SCR BIN 2.6 × 3 |
| 11 | 411 021 2704 | SCR S-TPG BIN 2.6 × 6 |
| 12 | 411 034 0902 | SCR FLT 2.6 × 8 |
| 13 | 636 035 7211 | ASSY RADIATOR |
| 14 | 636 024 1589 | INSULATOR |
| 15 | 636 024 1527 | HOLDER |
| 16 | 411 055 3906 | NUT HEX 2.6 |
| 17 | 636 035 7020 | INSULATOR |
| 18 | 411 023 2801 | SCR S-TPG PAN 2.6 × 6 |
| 19 | 636 037 3310 | COMPL, CH-1 |
| 20 | 636 037 3327 | COMPL, LD-1 |
| 21 | ⚠ 636 025 0697 | CORD, POWER |
| or | ⚠ 636 026 2669 | CORD, POWER |

## 4-2. Electrical Parts

**NOTE;**

- Materials of Capacitors and Resistors are abbreviated as follows;

Capacitors

CERAMIC ····· Ceramic Capacitor
ELECT ····· Electorolytic Capacitor
NP-ELECT ····· Non-Polarized Electrolytic Capacitor
TA-SOLID ····· Tantalum Solid Capacitor
POLYESTER ····· Polyester Capacitor
MT-POLYEST ····· Metallized Polyester Capacitor
COMPO-FILM ····· Plastic Capacitor
POLYPRO ····· Polypro Capacitor
OS-SOLID ····· Aluminum Solid Capacitors with Organic Semiconductive Electrolytic Capacitor

Resistors

MT-GLAZE ····· Metal Glaze Resistor (chip type)
MT-FILM ····· Metal Film Resistor
OXIDE-MT ····· Oxide Metal Film Resistor
CARBON ····· Carbon Resistor
SOLID ····· Solid Resistor

- Value symbols are abbreviated as follows ;

P ····· μF  U ····· μF  UH ····· μH

- Tolerance of Capacitor, Resistor and Coil (Inductor) are noted with follow symboles ;

D ····· ±0.5pF  J ····· ±5%  K ····· ±10%  M ····· ±20%  Z ····· +80%~−20%

## COMPL MA-1

| Location | Parts No. | Description |
|---|---|---|
| | | (CAPACITORS) |
| C0101 | ⚠ 636 029 4349 | MT-POLYEST 0.22U K 250V |
| or | ⚠ 636 037 1958 | MT-POLYEST 0.22U K 250V |
| or | ⚠ 636 037 1965 | MT-POLYEST 0.22U K 250V |
| C0102 | 404 053 2705 | CERAMIC 4700P M 400V |
| C0103 | 404 053 2705 | CERAMIC 4700P M 400V |
| C0104 | 404 053 2705 | CERAMIC 4700P M 400V |
| C0105 | 404 053 2705 | CERAMIC 4700P M 400V |
| C0106 | 404 053 2705 | CERAMIC 4700P M 400V |
| C0108 | 403 139 2905 | ELECT 2.2U M 50V |
| C0109 | 636 029 4356 | MT-POLYEST 0.01U K 630V |
| or | 403 180 3203 | MT-POLYEST 0.01U K 630V |
| C0111 | 403 069 1702 | CERAMIC 1000P K 50V |
| C0112 | 403 024 7206 | CERAMIC 390P J 50V |
| or | 403 024 7800 | CERAMIC 390P J 50V |
| C0113 | 403 067 6709 | MT-COMPO 0.22U J 50V |
| C0114 | 404 042 4109 | ELECT 47U M 400V |
| or | 404 042 6608 | ELECT 47U M 400V |
| C0115 | 403 129 5701 | ELECT 47U M 25V |
| or | 403 047 4305 | ELECT 47U M 25V |
| C0201 | 403 218 3106 | ELECT 1000U M 16V |
| C0202 | 403 134 5802 | ELECT 470U M 16V |
| or | 403 044 3004 | ELECT 470U M 16V |
| C0203 | 403 073 9107 | CERAMIC 4700P K 50V |
| C0204 | 403 071 8102 | CERAMIC 2200P K 50V |
| C0205 | 403 135 6204 | ELECT 0.33U M 50V |
| C0206 | 403 203 9502 | CERAMIC 0.1U Z 50V |
| C0208 | 403 069 5601 | CERAMIC 0.01U K 50V |
| or | 403 203 9304 | CERAMIC 0.01U K 50V |
| C0209 | 403 228 2007 | CERAMIC 560P K 500V |
| C0210 | 403 135 4002 | ELECT 47U M 6.3V |
| C0211 | 403 228 2106 | CERAMIC 220P K 500V |

| Location | Parts No. | Description |
|---|---|---|
| | | (DIODES) |
| D0101 | ⚠ 407 104 5304 | DIODE S1WB (A) 60 |
| D0102 | ⚠ 407 091 6704 | DIODE APO1C-VO |
| or | ⚠ 407 103 9402 | DIODE ERA22-08V5 |
| D0104 | 407 091 7008 | DIODE ERA22-02-V5 |
| or | 407 107 5905 | DIODE AUO1Z |
| D0106 | 407 099 7604 | ZENER DIODE MTZJ18B |
| or | 407 143 5105 | ZENER DIODE RD18ESB2 |
| D0107 | 407 012 4406 | DIODE 1SS133 |
| D0201 | 407 067 9609 | DIODE SB50-09J |
| or | 407 143 5204 | DIODE FMB-29 |
| D0202 | 407 012 4406 | DIODE 1SS133 |
| D0203 | 407 012 4406 | DIODE 1SS133 |
| D0204 | 407 137 3803 | ZENER DIODE RD2.7ESB1 |
| | | (INTEGRATED CIRCUITS) |
| IC101 | 409 225 1401 | IC FA5304P |
| IC102 | ⚠ 407 105 8304 | PHOTO COUPLE TLP634LF2 |
| or | ⚠ 407 105 8700 | PHOTO COUPLE PC113 |
| IC201 | 409 057 3000 | IC UPC358C |
| IC202 | 409 066 7303 | IC UPC78L05J |
| or | 409 112 1002 | IC M5278L05 |
| | | (COILS) |
| L0101 | 636 037 1996 | COIL, LINE FILTER |
| L0102 | 636 026 2317 | COIL, LINE FILTER |
| L0103 | 636 019 2621 | COIL, BEADS |
| L0201 | 636 024 3262 | COIL, INDUCTOR 10UH |
| or | 636 033 4649 | COIL, CHOKE |
| | | (TRANSISTORS) |
| Q0101 | 405 080 6308 | TR 2SK786 |
| or | 405 088 7505 | TR 2SK952 |

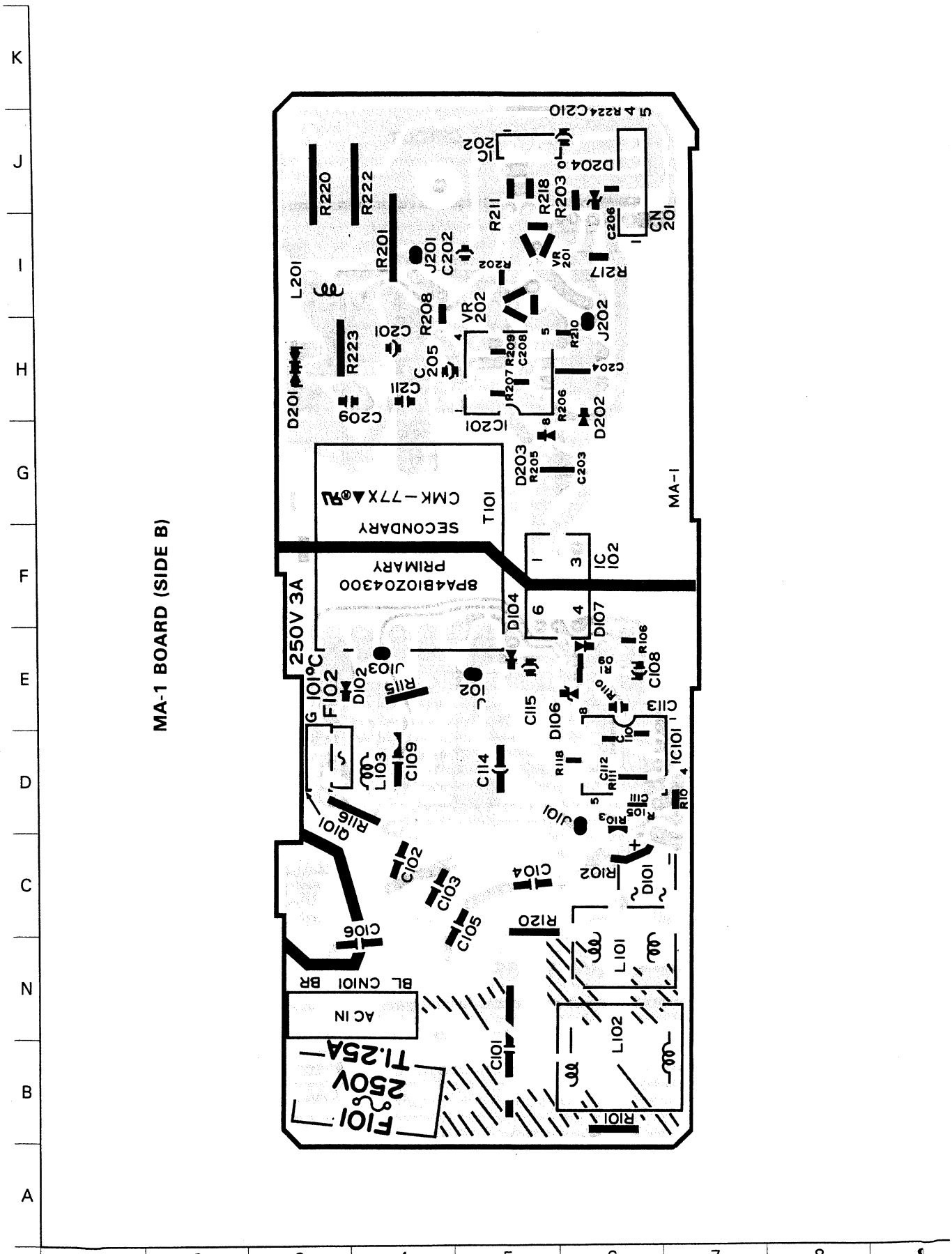
| Location | Parts No. | Description |
|---|---|---|
| | | (RESISTORS) |
| R0101 | ⚠ 401 090 3405 | CARBON 2.7M JA 1 / 2W |
| R0102 | 401 111 5500 | WIRE WOUND 3.3 KB 2W |
| R0103 | 401 023 3601 | CARBON 82K JA 1 / 4W |
| R0104 | 401 023 3601 | CARBON 82K JA 1 / 4W |
| R0105 | 401 023 3601 | CARBON 82K JA 1 / 4W |
| R0106 | 401 037 9101 | MT-GLAZE 180 JA 1 / 10W |
| R0109 | 401 037 9101 | MT-GLAZE 180 JA 1 / 10W |
| R0110 | 401 037 5202 | MT-GLAZE 100 JA 1 / 10W |
| R0111 | 401 037 5400 | MT-GLAZE 1K JA 1 / 10W |
| R0115 | 401 158 6003 | OXIDE-MT 47K JA 2W |
| R0116 | 401 167 3802 | OXIDE-MT 0.22 JA 1 / 2W |
| R0118 | 401 038 0503 | MT-GLAZE 22 JA 1 / 10W |
| R0120 | 401 090 3405 | CARBON 2.7M JA 1 / 2W |
| R0201 | 401 162 0400 | OXIDE-MT 0.1 JA 1W |
| R0202 | 401 038 2101 | MT-GLAZE 2.7 JA 1 / 10W |
| R0203 | ⚠ 401 018 3708 | CARBON 3.3K JA 1 / 4W |
| R0205 | 401 037 9200 | MT-GLAZE 1.8K JA 1 / 10W |
| R0206 | 401 039 0502 | MT-GLAZE 82K JA 1 / 10W |
| R0207 | 401 039 0502 | MT-GLAZE 82K JA 1 / 10W |
| R0208 | 401 012 4404 | CARBON 100 JA 1 / 4W |
| R0209 | 401 037 9101 | MT-GLAZE 180 JA 1 / 10W |
| R0210 | 401 038 4105 | MT-GLAZE 3.6K JA 1 / 10W |
| R0211 | 401 014 8509 | CARBON 1.6K JA 1 / 4W |
| R0217 | 401 018 2701 | CARBON 330 JA 1 / 4W |
| R0218 | 401 015 2605 | CARBON 1.8K JA 1 / 4W |
| R0223 | 402 061 4803 | FUSIBLE RES 47 JB 1 / 4W |
| R0224 | 401 038 6307 | MT-GLAZE 470 JA 1 / 10W |
| | | (TRANSFORMER) |
| T0101 | ⚠ 636 035 7587 | TRANS, SW |
| | | (VARIABLE RESISTORS) |
| VR201 | 636 033 4656 | VR, SEMI 1K |
| VR202 | 636 033 4656 | VR, SEMI 1K |
| | | (OTHERS) |
| F0101 | ⚠ 423 005 7407 | FUSE 250V 1.25A |
| or | ⚠ 423 014 7306 | FUSE 250V 1.25A |
| F0102 | ⚠ 636 035 7617 | FUSE,THERM |

## COMPLE CH-1

| Location | Parts No. | Description |
|---|---|---|
| | | (DIODES) |
| D0301 | 636 034 5157 | DIODE ERB81-004 L3 |
| or | 407 118 5901 | DIODE RK34LF-C1 |
| | | (COILS) |
| L0301 | 636 024 1732 | COIL, LINE FILTER |
| or | 636 024 2289 | COIL, LINE FILTER |
| or | 636 029 1553 | COIL, LINE FILTER |
| | | (TRANSISTORS) |
| Q0301 | 405 025 0200 | TR 2SD734-G |
| or | 405 024 9907 | TR 2SD734-F |
| Q0302 | 405 006 9604 | TR 2SB1140-R |
| or | 405 006 9703 | TR 2SB1140-S |
| or | 405 042 7107 | TR 2SB1140-T |
| | | (RESISTORS) |
| R0301 | 401 037 5608 | MT-GLAZE 10K JA 1 / 10W |
| R0302 | 401 015 1509 | CARBON 180 JA 1 / 4W |
| R0305 | 401 100 1506 | OXIDE-MT 120 JA 1W |

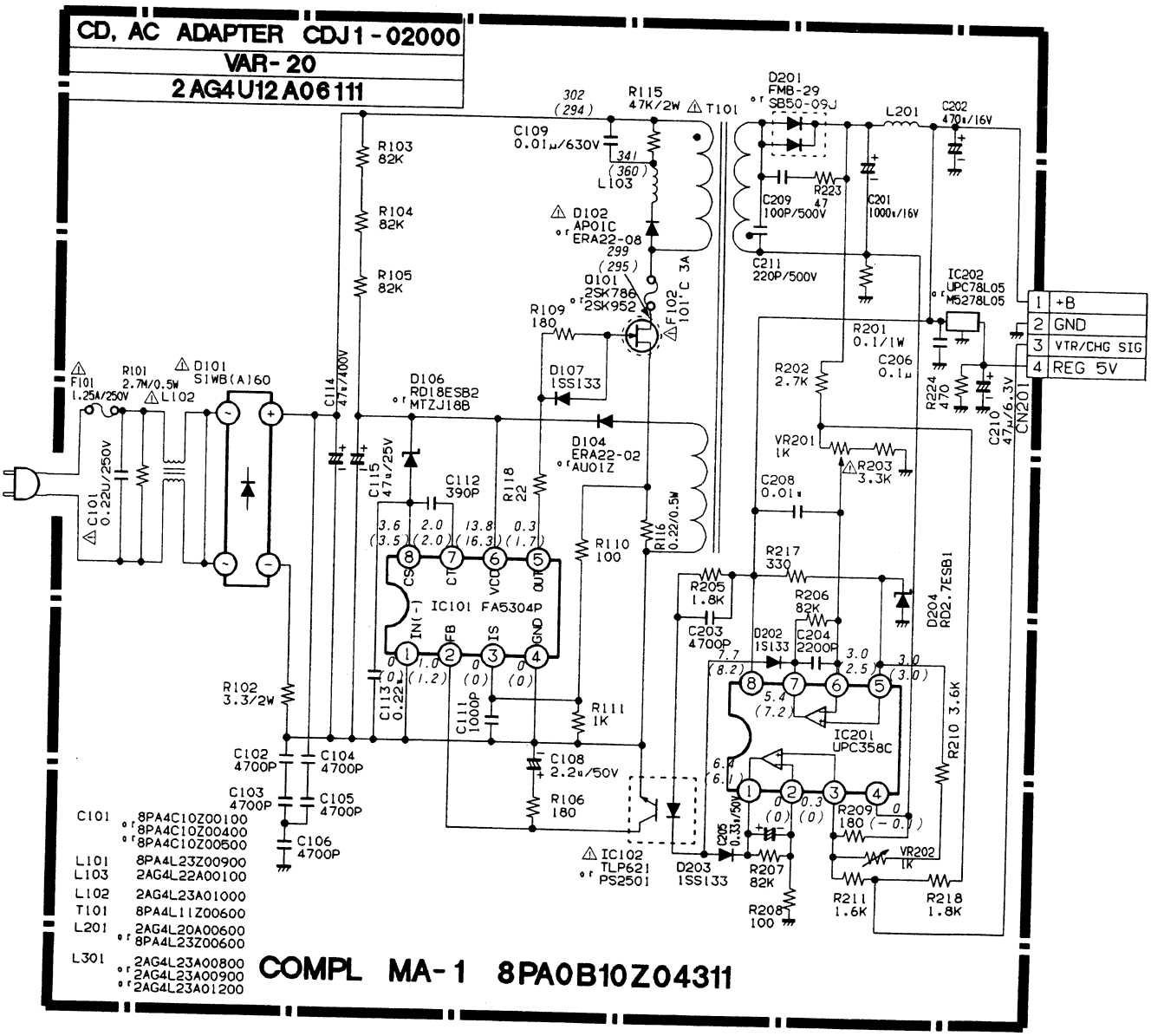
## COMPLE LD-1

| Location | Parts No. | Description |
|---|---|---|
| | 636 035 7044 | HOLDER |
| | 636 035 7006 | SHIELD |
| | | |
| | | (CAPACITORS) |
| C0401 | 403 114 3101 | CERAMIC 1U Z 16V |
| C0402 | 403 072 3403 | CERAMIC 0.022U Z 16V |
| or | 403 215 4106 | CERAMIC 0.022U Z 16V |
| C0403 | 403 022 2609 | CERAMIC 30P J 50V |
| or | 403 153 1809 | CERAMIC 30P J 50V |
| C0404 | 403 022 2609 | CERAMIC 30P J 50V |
| or | 403 153 1809 | CERAMIC 30P J 50V |
| C0405 | 403 114 3101 | CERAMIC 1U Z 16V |
| C0407 | 403 072 3403 | CERAMIC 0.022U Z 50V |
| or | 403 215 4106 | CERAMIC 0.022U Z 50V |
| | | |
| | | (DIODEAS) |
| D0401 | 407 109 1202 | LED SLB-25VR3F |
| D0403 | 407 104 5205 | LED SLB-25MG3F |
| D0404 | 407 012 4406 | DIODE 1SS133 |
| D0405 | 407 012 4406 | DIODE 1SS133 |
| D0406 | 407 056 8507 | ZENER DIODE RD5.1ESB2 |
| or | 407 099 5204 | ZENER DIODE MTZJ5.1B |
| D0407 | 407 143 5105 | ZENER DIODE RD18ESB2 |
| or | 407 099 7604 | ZENER DIODE MTZJ18B |
| | | |
| | | (INTEGRATED CIRCUITS) |
| IC401 | 410 122 2804 | IC MB88211P-G-178K |
| | | |
| | | (RESISTORS) |
| R0402 | 401 037 5400 | MT-GLAZE 1K JA 1 / 10W |
| R0403 | 401 037 5400 | MT-GLAZE 1K JA 1 / 10W |
| R0405 | 401 038 6307 | MT-GLAZE 470 JA 1 / 10W |
| R0406 | 401 037 5608 | MT-GLAZE 10K JA 1 / 10W |
| R0407 | 401 013 6308 | CARBON 12K JA 1 / 4W |
| R0409 | 401 037 5608 | MT-GLAZE 10K JA 1 / 10W |
| R0410 | 401 037 5608 | MT-GLAZE 10K JA 1 / 10W |
| R0411 | 401 037 5608 | MT-GLAZE 10K JA 1 / 10W |
| R0412 | 401 037 5608 | MT-GLAZE 10K JA 1 / 10W |
| | | |
| | | (SWITCH) |
| SW402 | 636 000 8656 | SPECIAL SWITCH |
| or | 636 035 7594 | SWITCH |
| | | |
| | | (OTHER) |
| X0401 | 636 024 1862 | RESONATOR, CERAMIC 4MHZ |


MA-1 BOARD (SIDE B)
K
J
I
H
G
F
E
D
C
N
B
A
1
2
3
4
5
6
7
8
9
MA-I
SECONDARY
PRIMARY
8PA4BI0Z04300
T101
CMK-77X
250V 3A
F102
F101
250V
T1.25A
AC IN
BL CN101 BR
IC101
IC102
IC201
IC202
L101
L102
L103
L201
R220
R222
R201
R223
R208
R211
R218
R203
R217
R210
R206
R205
R207
R209
R102
R120
R101
R115
R116
R118
R106
C101
C102
C103
C104
C105
C106
C109
C114
C115
C113
C108
C205
C201
C209
C211
C202
C204
C203
C208
C206
C210
D101
D102
D103
D104
D106
D107
D201
D202
D203
D204
Q101
VR201
VR202
J201
J202
J101
J102
J103
CN201

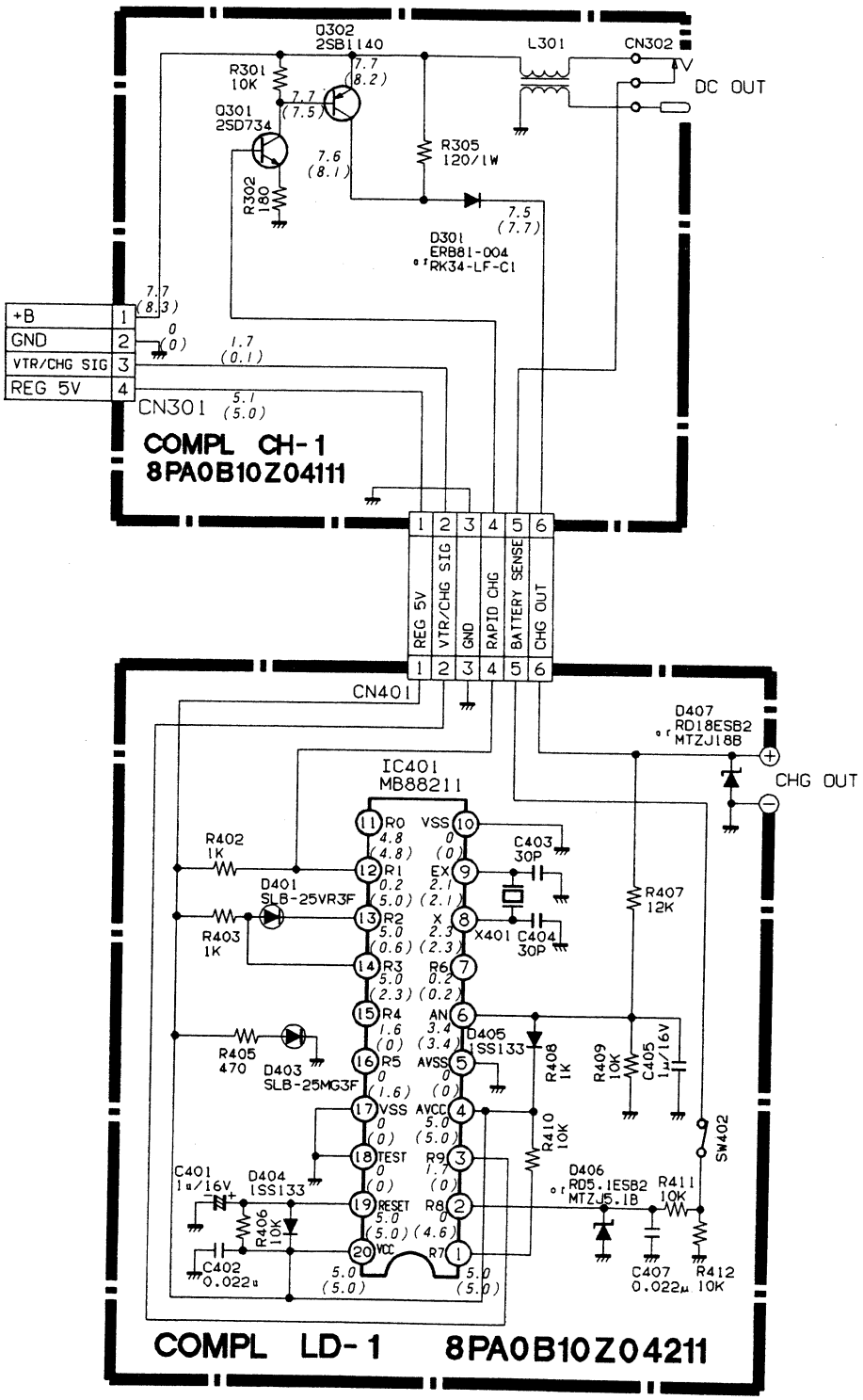
## 5. Schematic Diagrams and Printed Circuit Boards

### MA-1 CIRCUT



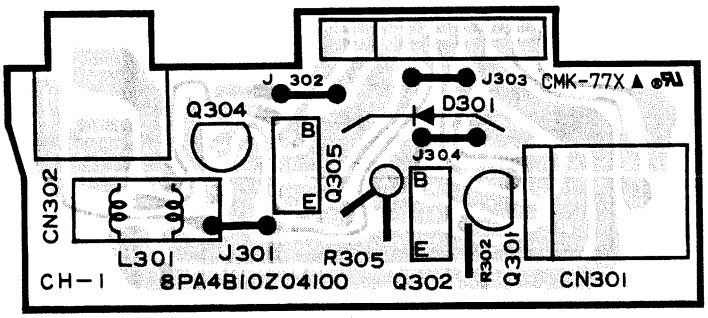

Conditions : a 220V AC input, when unloaded
(b) 220V AC input, when loaded

## LD-1 & CH-1 CIRCUITS



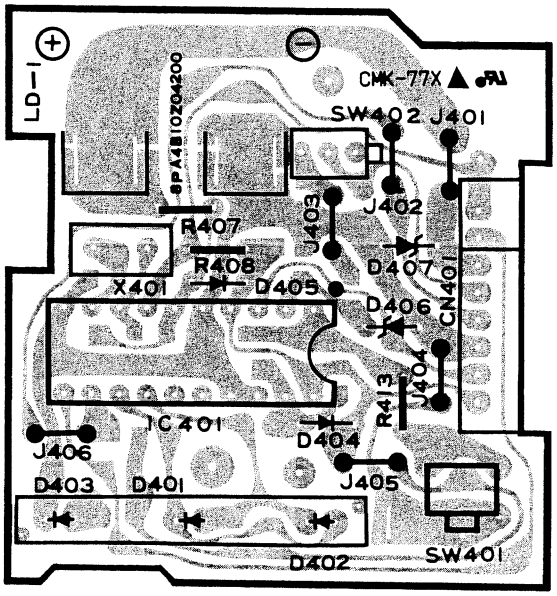

Conditions : a 220V AC input, when unloaded
(b) 220V AC input, when loaded

## CH-1 BOARD (SIDE A)

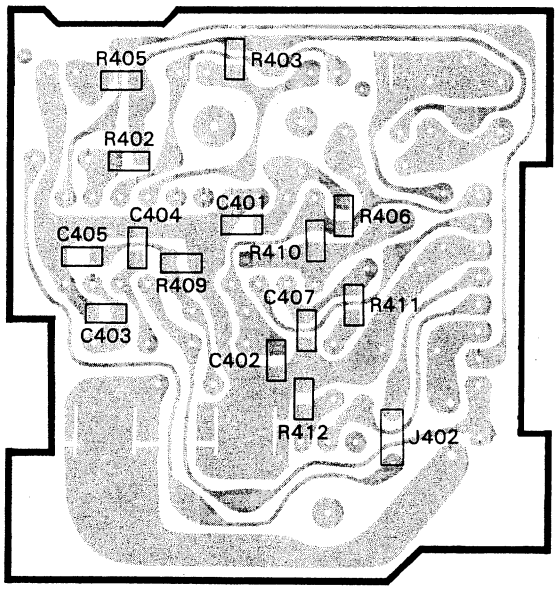



## CH-1 BOARD (SIDE B)

## LD-1 BOARD (SIDE A)




## LD-1 BOARD (SIDE B)



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